JPRS 75165

20 February 1980

# East Europe Report

## SCIENTIFIC AFFAIRS

No. 662

FBIS FOREIGN BROADCAST INFORMATION SERVICE

## NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

## PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

50272-101

| REPORT DOCUMENTATION PAGE | 1. REPORT NO. JPRS 75165 | 2. | 3. Recipient's Accession No. |
|---|---|---|---|
| 4. Title and Subtitle EAST EUROPE REPORT: SCIENTIFIC AFFAIRS, No. 662 | | | 5. Report Date 20 February 1980 |
| | | | 6. |
| 7. Author(s) | | | 8. Performing Organization Rept. No. |
| 9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201 | | | 10. Project/Task/Work Unit No. |
| | | | 11. Contract(C) or Grant(G) No. (C) (G) |
| 12. Sponsoring Organization Name and Address As above | | | 13. Type of Report & Period Covered |
| | | | 14. |

15. Supplementary Notes

16. Abstract (Limit: 200 words)


This serial report contains press and radio coverage on the development of and progress in the various theoretical and applied scientific disciplines and technical fields; and the administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences.


17. Document Analysis a. Descriptors

| | |
|---|---|
| x International Affairs | Scientific Societies |
| ___ Albania | Research Management |
| x Bulgaria | Organizations |
| ___ Czechoslovakia | Research |
| ___ German Democratic Republic | |
| x Hungary | |
| ___ Poland | |
| ___ Romania | |
| ___ Yugoslavia | |

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group 5B

| 18. Availability Statement | 19. Security Class (This Report) | 21. No. of Pages |
|---|---|---|
| Unlimited Availability Sold by NTIS Springfield, Virginia 22161 | UNCLASSIFIED | 40 |
| | 20. Security Class (This Page) UNCLASSIFIED | 22. Price |

(See ANSI-Z39.18)

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

JPRS 75165

20 February 1980

# EAST EUROPE REPORT

## SCIENTIFIC AFFAIRS

No. 662

CONTENTS PAGE

SOVIET-HUNGARIAN SCIENTIFIC-TECHNICAL COOPERATION AT THE CENTRAL PHYSICS RESEARCH INSTITUTE

Budapest MERES ES AUTOMATIKA in Hungarian Vol 26 No 11, 1979 pp 407-410

[Article by Ferenc Szabo, Dr of engineering sciences, KFKI (Central Physics Research Institute)]

[Text] The agreement on Soviet-Hungarian scientific and technical cooperation, which is a major factor in the scientific and technical life of Hungary, was signed 30 years ago. An agreement of this kind has a very positive effect on the work of the research institutions, especially if one of the parties of the agreement is a country which plays a decisive role in the world's scientific and technical affairs, such as the USSR. Also, the effect is particularly pronounced in a research institution which is a major one of the country concerned, and in which nuclear physics and nuclear energy are one of the main areas of endeavor. It is a well-known fact that many of the experimental facilities required for these studies are very expensive and that only the richest countries can afford them.

The cooperation embodied in the agreement permits Hungarian researchers to carry out active and useful work in the above subjects. However, the spirit of the agreement suggests more than just this; it ensures that the scientific and technical base is strengthened in both countries. As a result, the cooperation is beneficial to both parties of the agreement.

We will not accused of being immodest if we declare that our relationship is indeed mutually beneficial. This is perhaps best illustrated by the examples which we shall discuss below and the scientific conference dealing with the cooperation between the Kurchatov Nuclear Energy Institute and the KFKI, which is scheduled for this spring in Budapest.

The pages of this entire issue would not suffice for a listing of the accomplishments of the last 30 years. Since this is not the first time that we report about our activities to the readers of MERES ES AUTOMATIKA, we will discuss this time some of the accomplishments which cover the subject matter of this journal [1].

The Soviet Union has supplied a research reactor to the KFKI; this opened up new perspectives. In the work carried out at this facility, the staff of the Institute cooperates with various Soviet scientific institutions, as it has since the reactor was started up.

The first phase of the joint work featured the development of the special measurement electronics required for research with the reactor. Now that the three-axis neutron spectrometer has been developed this phase has come to an end. In the next phase we createdelectronic devices for a variety of uses, and implemented them in Soviet reactors and inactive test stands. Although this phase of the work is not yet completed—for example we still carry out periodic measurements in Soviet institutions with the stochastic analyzer which we developed—the main feature of our cooperation has been for the last 10 years the correlative speed measurement.

In the field of correlative speed measurement our cooperation with the Institute of Physical Energetics in Obninsk started when the need developed during the development of the "Sever" type small nuclear power plant for the creation of a method of measurement and a suitable device to determine the flow rate of the cooling medium in the active zone heated by convective water. The stochastic metrological traditions of the Reactor Electronics Department as well as its experience gained in noise analysis suggested that the problem should be solved by measurement of the flowthrough time with the aid of thermoelements. This method is based on the observation that the temperature of the flowing medium always fluctuates around its own average if intensive heat exchange takes place in the cooling loop, and that this fluctuation pattern always follows the medium. Thus, the changes in the readings of two temperature sensors located in the flow path at a given distance will generally be identical (except for a temporal displacement), so that the cross-correlation function of the two signals will show a maximum at a shift corresponding to the flowthrough time. If we measure the temporal shift belonging to the maximum, we can simply establish the speed if we know the base distance.

We realized electronically this tantalizingly simple measurement principle in the KFKI, and carried out the required application-engineering studies in Soviet stands and nuclear power plants. As a result, we developed a

target-instrument prototype which now is widely used in nuclear technology and many other areas of industry and research.

At the present time we work on the development of a multichannel version of this instrument. It will be used in RBMK type reactors with a unit power of 1000 MW (electr.).

Even this first example demonstrates the important role played by Hungarian electronics and metrology. This, in fact, is a feature of our cooperative projects. Various Soviet institutions use many metrological and computer-technological devices. It was through this avenue that we joined the studies on thermonuclear fusion. One result of this work is that the TOKAMAK type fusion research device was installed this year at the KFKI. The theory and realization of this device was developed by Soviet scientists. Today, this is one of the approaches being studied everywhere in the world with the aim of ultimately developing a fusion-based reactor. The importance of this device is obvious: it enables Hungarian researchers to take part in the most modern research themes.

Another important fact is that the KFKI has supplied the computerized measuring and automating devices for the T7 TOKAMAK system at the Kurchatov Nuclear Energetics Institute in Moscow. It is an important feature of the studies on the T7 TOKAMAK that this is the first such device in the world operating on the basis of the cryogenic principle.

The computerized measuring and automatig system consists of two parts; accordingly, it comprises two main units.

One unit controls the cryogenic system and indicates the critical states. It measures the temperature in various parts of the system with thermocouples and resistance thermometers, checks the He and N yields, and measures the pressures of these gases. It also measures the input and output parameters. The cryogenic measuring system handles 266 slow analog signals, 60 high-speed analog signals, and 64 digital input/output signals. The main computer is the TPA-i small computer with a 24K operative memory. The peripheral devices are CAMAC modules.

An interesting feature of the measuring system is that it contains, in addition to the TPA-i small computer, three CAMAC frames with microprocessor-based intelligent controls in them. The latter perform partial tasks independently. Another interesting feature is the fact that the system has a highly developed man/computer relationship. The operators obtain information about the cryogenic system continuously via four graphic and alphanumeric, plus four alphanumeric displays.

The other unit is the joint system of technology and diagnostics. Its technological measurements are the following (128 slow analog signals and 144 digital input/output signals):

- Plasma flow, plasma voltage, plasma location are measured;
- Various magnetic fields are measured;
- Supply voltages are measured;
- Temperatures are measured;
- Vacuum parameters are measured;
- Initial conditions are examined.

The diagnostic measurements are of the following types:

- Laser measurements;
- Microwave measurements;
- Soft X-ray measurements;
- Probe measurements;
- Mass-spectroscopic measurements.

These joint measuring systems consist of the basic TPA-i computer with a 24K memory, two intelligent substations, three graphic displays, two magnetic tape memories, two plotters, and the usual complement of computer peripheral devices. CAMAC modules are the real-time peripheral units here too. There is also an analyzer in the system. The task of this measuring system is to check the technological parameters, to evaluate the diagnostic results, to determine the plasma properties, and to file the measured data.

The relationship between the Kurchatov Nuclear Energy Institute and the KFKI has a long past. It also covers other fields such as joint measurements, joint research projects, development of joint research facilities, and—in some instances—joint marketing of such facilities. The project which is a good example of recent cooperation started in 1975. During the regular annual conferences it was decided that the facilities of the laboratory studying superconductivity should be developed jointly. As the work was divided between the two institutions, the cryostat and superconducting magnets were assigned to the Kurchatov institute, while the following were assigned to the KFKI:

- The power supplies for the superconductive solenoids;
- The instruments for the measurement of the magnetic fields;
- The instruments for the measurement of temperature;
- The helium-level sensors;
- The instruments for measuring the superconductive sample;
- The intelligent controller of the measuring system.

particle type (electrons, protons, alpha, heavy ions, and so forth) distribution of cosmic radiation over a wide energy range. A microprocessor controls the operation of the device.

In addition to our cooperation with the Kurchatov Nuclear Energy Institute, we also cooperate with the FIAN institute. The basis of the latter cooperation is the Soviet-Bulgarian-Hungarian agreement covering joint study of cosmic radiation. The data-acquisition and data-recording instrument ("Klara"), developed within the framework of the cooperation for the study of extensive cosmic air showers, was started up during the late 1960's; the "Kronotron," a time-measuring instrument operating in the nanosecond region, was installed in 1973 at the high-altitude research station located in the Tien-San mountains. The "Kronotron" is basically a signal-processing electronic system consisting of two perpendicular 40 m base-distance detector pairs and a unit made up of components and special target units of the Modular Nuclear Instrument Family. Measurement of the time differential between the responses of the two detector pairs permits the determination of the incidence-angle distribution of the "showers" in space. We regularly check the operation of the instruments operating in the high mountains, and update them as necessary.

An important role is played in Soviet-Hungarian cooperation by projects carried out in the EAI in Dubna [Joint Nuclear Research Facility] as well as activities covered by agreements with the EAI on other projects. It is not possible to summarize the full range of the projects carried out there since there are so many Hungarian researchers working there. We can merely point out some examples.

Since 1973, we make at the KFKI one- and two-coordinate multifilament proportional chambers and associated signal-processing electronic systems in various sizes and designs (128 x 128 $mm^2$ to 600 x 1000 $mm^2$ active surface, with signal-wire distance of 2 mm, with perpendicular and oblique winding). These multifilament proportional chambers are among the most modern means for particle detection. Insofar as their operation is concerned, they are densely located proportional counters in large numbers, which are independent of each other while placed in a common gas chamber and located in precisely defined geographic locations. The electronic signal processing system associated with the signal wires establishes the coordinates of the transit locations of the elementary particles through the chamber in a TTL-compatible form.

Accordingly, these detectors are used for the determination of various nuclear reactions, the examination of interactions among elementary particles, measurement of angle distribution and particle tracks, measurement

of radiation distribution over large areas, examination of diffraction patterns, and so forth. The reliability and lifetime of proportional chambers is considerably affected by the tautness of the elementary wires of the filament planes. We developed a "filament-tautness measuring instrument"(Type NE-660) for the rapid checking of the chambers during manufacture. The tensional force in the mechanically stressed electrically conductive filaments is measured indirectly: the filament is placed in a constant magnetic field and caused to resonate at the basic inherent frequency with synchronized current pulses. The period duration of the oscillation is then measured. The magnitude of the stressing force can then be unambiguously determined from the measured period times if we know the geometric dimensions and the material parameters. We made five such devices for the EAI in recent years, and another five for use in French and Swiss institutions.

Another example of the wide cooperation is when the theoretical elaboration and practical realization of an idea is accomplished by joint effort. The theoretical and practical work concerning the device we shall now describe was carried out jointly by the Physics Research Institute of the Armenian Academy of Sciences, the Crystal Physics Research Laboratory of the MTA [Hungarian Academy of Sciences], and the KFKI. As a result of this work, an instrument was developed for the measurement of single picosecond light pulse durations.

In the mode-synchronization operating mode of the pulse lasers light pulses in the picosecond range are generated. Measurement of the duration of these pulse durations is possible only under special circumstances even with the most modern electronic instruments. The pulse-duration measuring instruments, with various accuracies, cost between 20,000 and 30,000 dollars, which is sometimes the price range of the laser itself, while they are really no more than auxiliary instruments for them. (By using these instruments, the energy and light intensity can be determined simultaneously.)

Our goal was the development of a relatively simple and inexpensive instrument for measuring individual (not series) picosecond pulses.

The measurement is based on the generation of so-called noncollinear upper-harmonics, which have already been used for the measurement of picosecond pulses. However, in earlier instruments the actual measurement could be carried out only if there was a series consisting of precisely identical pulse lengths. In practice, however, we tend to have pulses with variable duration, the duration changing from injection to injection.

With the aid of a special setup we achieved that the temporal characteristics of the light pulses can now be determined from the spatial distribution of the upper-harmonic light generated in a noncollinear manner (in our case, this distribution is generally elliptical). We demonstrated the suitability of the method by test series in the 0.1 to 100 psec range. We found that the accuracy was ±10%; this largely meets the needs of the users.

We decided to present last the project which illustrates the collaboration not only in the research sphere but also in the practical application of the results of research.

A computerized system was developed under the administration of the VILATI [Electrical Automation Institute] for the quality testing of completed Diesel engines at the automobile factory in Kama by means of a computerized system. As required by engine-technological considerations, the test series consists of three basic phases: cold-running, hot-running, and final acceptance testing.

The tests in the various phases are based on comparison with reference values for the engine type being tested. Many of the reference values are available following the on-line test-data acquisition by the computer system, such as various engine parameters like power, reduced power, and consumption. Twelve test benches are associated with a computer system. The major tasks of the system are the following:

- Recording the utilization factors of the test benches;
- Test-sequence control for the cold-running, hot-running, and acceptance testing of all engine types being manufactured;
- Measurement and calculation of the characteristics of the tested engines;
- Preparation of the test protocols (six different types);
- Display of the status of the components of the testing system.

The computer used is of the TPA-i type with an operating memory of 32K and the options required for real-time operation. The technological signals are combined to the computer via a CAMAC process periphery system. The CAMAC system is connected to the technology by means of 288 digital inputs, 288 digital outputs, 96 interrupt-request inputs, 122 analog inputs, and 24 analog outputs. The software means of the task-solving program system is the RTS/i real-time operating system, which contains the special tasks for engine testing also.

The work aimed at the development of the systems started in 1975. During 1978 we delivered 15 computer configurations to the factory in Kama. We expect that startup will take place in 1980.

It is our belief that what we have described above demonstrates the versatility of the cooperation, namely that Hungarian researchers were able to participate in international research projects and that this participation had a major contribution to the economic development of Hungary. The best way to illustrate this is the nuclear power plant in Paks.

2542
CSO: 2502

## STRUCTURE, ORGANIZATION OF ES 5067-02 MAGNETIC DISC PACK

Budapest SZAMITASTECHNIKA in Hungarian Dec 79 p 5

[Article by N. Botev and Zh. Paskalov: "Structure, Organization of the ES 5067-02, 200/100 Moyte Magnetic Disc Store"]

[Text] With the appearance of the 100 Mbyte capacity magnetic disc storage pack not only was there a quantitative improvement of the parameters but also a qualitative leap in the development of external memory units.

In the case of the 200/100 Moyte capacity disc pack the servo-surface was the most essential innovation. The information on the servo-surface is used for the following purposes:

--track setting and re-setting;

--generation of counting impulses at the time of the retrieval operation;

--seeking out the precise positioning of the read/write heads on the band;

--execution of repositioning;

--control of the positioning angle of the disc pack;

--generation of the index signal; and

--synchronization of data at the time of the write operation.

The repositioning operation was introduced to increase the reliability of the storage. If the read-out of the information during reading is not correct, a repeated read-out series begins, then the heads are repositioned by a maximum of 40 microns to either side of the center line of the band. In this way "slight" errors are corrected and there is compensation for possible imprecisions in the radial setting of the heads. Repositioning is forbidden during writing.

Data are placed in the bands in the form of records; the quantity and length of these can be varied. The time which elapses from the appearance of the index impulse to the sensing of the desired record is the access time. Control of the positioning angle of the disc pack was introduced to decrease this time and to free the central unit for the performance of other operations.

The disc pack is uniformly divided into 128 equal sectors each of which has a length of 105 bytes (13, 440:128 equals 105). Two counters connected in series take part in developing the addresses of the sectors (from 000 to 127):

--a counter for servo-synchron impulses; and

--a counter for sectors.

Since the following period of the servo-synchron impulses is equal to 2,480 nanoseconds (the time for 2 bytes) there are 52.5 impulses per sector. To avoid this there are paired sectors which contain 5' servo-synchron impulses (0 to 52) and unpaired sectors which contain 52 se -synchron impulses (1 to 52). Every outgoing impulse of the servo-synchron impulse counter increases the content of the sector counter by one. The index signal erases the contents of both counters. There is a trigger ("second half of sector") built into the storage which goes into condition 1 with every 23rd servo-synchron impulse. In this way the information is derived with an even smaller time interval than the sector.

If every record on a given band is equal then the addresses of the sectors can be counted from where the records begin. If the length of the records is not equal then, at the time of the write operation, the address of that sector must be noted in which the given record begins. In diagram 1 record number 20 can be found in the 115th sector. In this case the number 113 (115 minus 2) must be entered in the sector address register. When the sector counter reaches 113 an interrupt signal is sent to the control module. In every case the time which corresponds to the running time of the two sectors (in this case from 113 to 115) is given so that the central unit will have time to interrupt the operation to be performed and prepare to receive the data read out from the 20th record.

The time for each sector is about 130 microseconds.

The index signal is a chain of double dibits (1) and intervals (0) (an index is also developed in the protection zones, but using single digits); the code of the index in ne servo-zone is 11010110. There is such a series on every band of the disc pack, forming a very narrow cylindrical sector thereon.

In order to avoid an incorrect generation of an index the above series can be decoded only at the time of the 50th, 51st and 52nd servo-synchron impulse of the 127th sector, and at the time of the zero, first, second and third servo-synchron impulse of the zero sector (the so-called index window).

The "modified frequency modulation" writing method ensures great information density. Thus the records vary as a function of the number of the cylinder and take into consideration the difference between the flying conditions of the heads.

When writing the preliminary compensation decreases the influence of phase differences appearing with different coding combinations.

Another innovation in the disc pack is the monitor which watches the correctness of the execution of the basic operations taking place in the storage. These operations correspond to the following seven operational modes of the monitor:

--track setting;

--re-setting;

--search;

--end of search;

--reading;

--writing; and

--switching sequence.

Every operational mode is divided into eight conditions; in the event of the correct execution of the operations in the disc pack the conditions go into operation one after another in sequence. If any of the conditions appear before the preceding condition goes into operation the monitor error trigger goes to position 1.

The so-called diagnostic operational modes serving to watch the condition of the disc pack are initiated from the control module.

Information according to the BU-3 lines for the number 12 program instruction is stored in the diagnostic register (three triggers). This information defines six diagnostic operational modes. The circuits being diagnosed have separate inputs, independent of those which go into operation under normal operation.

Diagram 2 shows the construction schematic of the storage, showing the several blocks and part units of the disc pack, the connections between them and the input and output lines which link the disc unit with the control module. The organization of the interface used here is different from that of the 7.25 and 29 Mbyte capacity units. The purpose of the several lines and bars is as follows:

--Identification bars; these are multiplex bars through which instructions go from the control unit to the disc pack, defining the instructions to be carried out;

--Byte control bars; these are multiplex bars through which signals go from the control module to the disc pack, signals which, together with the signals of the identification bars, define the required instructions and addresses;

--Authorizer; a multiplex bar for decoding the signals;

--Disc pack selector; a multiplex bar through which the concrete disc pack is chosen, according to the instruction, from among those connected to the control module;

--Sequence; this bar is used to give the signal which initiates the track setting of the head in the disc pack;

--Response byte bars; these are multiplex bars through which information pertaining to store conditions or address reception goes from the disc pack to the control module;

--Physical address bars; the code for the logically connected disc pack ("3, from 6") goes from the multi-core to the control module, from the series of those physically connected;

--Validity of identification bars; a multiplex bar through which a signal goes from the disc pack to the control module, in the case of correct parity on the identification and response bar;

--Disc pack breakdown; a multiplex bar which gives a signal if the pack breaks down;

--Heads in disc pack; two bars which short-circuit when the heads are engaged;

--Read/write data; a selector channel for two-directional, sequential data transmission; and

--Servo data; a selector channel which, during the write operation, carries the servo-impulses from the disc pack to the control module in order to synchronize the data.

The interface control block decodes the signals transmitted by the control module in the form of instructions and addresses and processes the response signals pertaining to the condition of storage.

The breakdown block watches for breakdowns in the disc pack which might destroy the information chain in the disc pack; it blocks the reception of incoming signals and the write schemas and generates an appropriate signal for the control module.

In order to save channel access time the address is sent to a sector address register. This address is compared in the sector address comparison block to the current sector address generated by the sector/index block. In addition, on the basis of reproduced information obtained from the servo-surface, an index impulse is generated with every cycle of the sector/index block; this provides the physical beginning of every band of the disc pack.

The address of the desired cylinder goes to the cylinder address register and the address of the desired head goes to the head address register, and this also gives the band of the given cylinder.

The difference counter register receives the difference between the cylinder desired and the addresses of the cylinder thereon, on which the head is positioned. During the time of positioning the content of the differences counter register decreases as each cylinder is traversed.

The access control block receives appropriate instructions and transforms them into signals for servo-system control, which in turn controls the movement of the car with the heads, or the precise positioning of the heads on the desired cylinder.

The linear motor is the executive organ of the mechanism of the servo-system. This assembly includes a cycle counter which generates the signal for the relative movement speed of the car.

The diagnostic block watches the condition of the storage and is used primarily to discover breakdowns.

The regime/monitor block checks the sequence of the basic operations of the disc pack, using for this purpose information concerning the condition of the printed circuit cards and the numerous junctions of the circuit units.

The control console serves to start and stop the store and to intervene in the work thereof.

Reading and writing is only reproductive and complex-autonomous.

The logical address unit is used to call up the desired address of any disc pack connected to the control module.

Mechanical operation protection protects the information stored on the discs from unauthorized intervention.

The read block receives the signals read by the selected head and creates read data from them.

The write block receives write data from the control module and executes the writing with the aid of the selected head.

The head selection block provides the physical connection of the single head desired with the read block or the write block.

The servo data block receives the data reproduced by the servo head and transmits them to the appropriate block to generate sector and index signals, to control the servo-system and, during the write operation, to synchronize the data.

An impulse is generated in the position of heads block during all cylinder traverses; a signal is generated to position the head to a definite position relative to the midline of the band.

The chief technical characteristics of the ES 5067-02 are:

--capacity, 2 x 100 Mbytes,

--information transmission speed, 806 KB per second,

--average time for position setting, 30 microseconds,

--number of bands, 411, and

--cycle frequency of disc pack, 3,600 per minute.

With the aid of the ES 5567 control unit and the ES 5667 control module the ES 5067-02 storage can be connected to the multiplex-channel blocks of the ES 1035, ES 1045, ES 1055, ES 1060 and ES 1065 computers and with the aid of the ES 5667 control module alone to the ES 1015 and ES 1025 computers (so-called integral connection).

8984
CSO: 2502

MIMI '80 TO BE HELD IN BUDAPEST

Budapest SZAMITASTECHNIKA in Hungarian Dec 79 p 14

[Text] The sixth international symposium (MIMI ' 80) on mini and microcomputers and their applications will be convened by the International Society for Mini and Macrocomputers (ISMM) between 9 - 11 September 1980 in Budapest. The symposium is being jointly sponsored by ISMM and the Hungarian Academy of Sciences. The last symposium of this sort was held in Zurich.

The symposium will deal with the following topics:

1. Hardware: technology, architecture, microcomputer elements, computer systems and networks, modular computers, distributed systems, peripherals, intelligent terminals, etc.

2. Software: program languages, devices and methods for programing microcomputers, trends in programing, methodology, training, etc.

3. Applications: data processing, collection and computer control of metering data, applications in public health and laboratories, computer-assisted design and production of durable consumer goods, computer application to energy conservation, administration, etc.

Applications to present a paper may be made by submitting a 200-word summary. The deadline 15 May 1980. Complete text of the papers accepted must be received by the International Program Committee by one September 1980. The lectures will be published after the symposium.

English will be the official language of MIMI '80. The lectures will be presented and published in this language.

All questions pertaining to participation should be addressed to the MIMI '80 Secretariat (Judit Soltesz, Konferencia Iroda [Conference Office]; MTA SzTAKI; [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences]; H-1502; Budapest 112, P.O. B. 63; Tel: 253-442; Telex: 22-5066) which will be glad to provide information.

CSO: 2502

COMPUTERS TO BE USED IN FIELD CROP PROTECTION

Budapest SZAMITASTECHNIKA in Hungarian Dec 79 p 16

[Text] In the future protection of field crops will be implemented with the aid of computers. This is expected to lead to more efficient use of chemical weed killers and savings of the chemicals, most of which are imported, used in these herbicides. The process, new even in international terms, was evolved by four members of the station for plant protection and agro-chemistry of Baranya County: Dr Miklos Ujvari, State Prize holder and agrobotanist; Attila Fekete, chemist-cybernetics; and Daniel Pfeifer and Dr Peter Resinger, herbologists. A three-year test series was completed this year. The new technology was used successfully on 55 farms in Baranya County which raised 80 percent of the county's corn. The procedure was evaluated at home and abroad in the course of numerous professional debates. As a result, it will be used on all large farms in 1980, initially to protect the nation's most important fodder crop: corn.

Essentially the system consists of collecting weed samples from a designated area and recording the most important agrotechnical data at the same time. A computer then processes these findings which are used as the basis for the plant protection plan for the next year. The required herbicides are ordered on the basis of this. Up to now the farms have had no objective basis for protection of field crops, and there was a tendency to overprotect and thereby waste chemicals. The new computer assisted system has been worked out for all field crops, and the various types of technological procedures have been prepared on this basis.

CSO: 2502

# LACK OF PARTS, COMPONENTS HAMPERS TRADE IN COMPUTER EQUIPMENT

Budapest KULGAZDASAG in Hungarian No 12, 1979 pp 34-43

[Article by Lorant Holtzer, economic director of the Institute for Metrology and Computer Technology Research of the Central Physics Research Institute: "Concerning Obstacles to the Capitalist Export of Our Computer Technology Equipment"]

[Text] Today computer technology is among the most dynamically developing branches of industry in every large industrial country. The annual growth of production of 13-14 percent significantly exceeds the average for industrial growth around the world, surpassing even that of the most dynamically developing branch of industry, the machine industry. The figures for production growth are imposing even in Hungary but products of the computer technology branch represent only an insignificant part of our non-ruble accounting export. In addition to the obstacles characteristic of other export there are, in our opinion, also price reasons for this.

Development of the electronic industry constitutes an organic part of the transformation of the machine industry product structure. (By electronic industry we mean the signal and vacuum technology industry, the instrument industry and the computer technology industry.) During the past 15 years the production of the electronic industry has increased sixfold. The spread of semiconductor devices has been the crucial factor in this growth. For years the growth of this branch of industry has exceeded the average growth of the machine industry and during the fifth 5-year plan it provided nearly one quarter of machine industry production; its contribution to machine industry export exceeds even its share in production. In addition, the most important indexes indicating effectiveness (net income, profit proportional to assets) are more favorable in the electronic industry as compared to the machine industry average. The transformation of the product structure and selective development also appear in the structural changes within the electronic industry. Some manufacturing branches and product groups are developing at a very high rate while others to a considerably less degree.

Computer technology manufacture is among those branches within the electronic industry showing the most dynamic growth also. In 1970 computer technology did not provide even one percent of electronic industry production. In 1975 it represented a share of about 12 percent. We export about 60 percent of the production of the computer technology industry to socialist countries (this goes well beyond the same index for most branches of industry). But the figures for dollar relationship export are insignificantly small (a few million dollars per year) and while the capitalist foreign exchange balance for the electronic industry as a whole is a bit positive the industry producing computer technology products has an unambiguously negative balance. In addition to other reasons for this difference--which are not to be ignored--the decisive factor is certainly the different composition of parts. While the production and sale of other products of the electronic industry can be imagined on the basis of parts which are not the newest it is on the one hand simply vital to use the newest and most modern parts in the manufacture of computer technology and, on the other hand, these most modern parts are not available to us in sufficient quantity or adequate variety from either domestic or socialist sources.

The importance of the question and the first steps leading to a solution are indicated by the fact that the KGM [Ministry of Metallurgical and Machine Industries], bringing in the best experts of the industry, has worked out a developmental conception for the electronic industry. This was recently accepted by the State Plan Committee and within this framework the development of electronic parts manufacture has been approved as a central development program.

Surveying the extraordinarily swift development of the leading electronic industries of the world and the possibilities of our country it can be established that Hungary cannot by itself create the parts base needed for the development and manufacture of the computer technology branch. Gigantic sums are spent throughout the world to create a research and development and manufacturing base for parts. Our homeland can join in this process to only a small degree with the material resources at its disposal. (It is another question--and the scope of this article does not make it possible to go into it in detail--whether domestic experience shows that the uniting of intellectual and material resources into a Computer Technology Research and Development Society or Research and Development Association would increase the effectiveness of use.)

In just this area there is great need for activity to be undertaken within the framework of the international division of labor--primarily through cooperation with the socialist countries. The Soviet Union, the GDR and Czechoslovakia have made significant efforts to develop microelectronics and they have results ready at hand.

But even in the event of more effective cooperation with the socialist countries and an expansion of domestic development and manufacture it can be expected that for a long time still we will need to import from

capitalist countries a number of the parts needed for the development of and manufacture by the computer technology branch.

The effect of the products of the computer technology industry on the economy of a country appears not only in the satisfaction of domestic demand or in the improvement of the foreign trade balance and the international financial balance by means of export; by building them into other machine industry products the technical level of these increased and this facilitates their sale and improves export possibilities and the dollar or ruble generation indexes. So it can easily be seen how important it is to increase the export of our computer technology products.

We might conclude from the fact that we export about 60 percent of our computer technology products in the socialist relationship that there are no problems with our export. Every year, however, greater difficulties characterize the situation in connection with the magnitude of socialist export. The Hungarian computer technology industry reached relatively quickly (in any case more quickly than our socialist partners) a level which gave us a favorable position on the socialist market from the viewpoint of both quantity and price. Now, however, we are finding on this market ever more frequently computers manufactured in other socialist countries. Frequently they are inclined to buy from us only to the extent that we buy from them; they are trying to use their own computers instead of Hungarian ones and they are trying to use the Hungarian export quota for peripherals rather than for computers.

Maintaining our prices is running into ever greater difficulties on the socialist market as compared to the favorable times--when we had no competitors. With the appearance of competitors they started trying to force down our prices.

One reason for the decrease in our prices, in a paradoxical way, is based on the price formation principle adopted by the socialist countries. As is well known socialist world market prices must be formed taking into consideration the capitalist world market prices. The capitalist world market prices for computer technology equipment are constantly decreasing--simultaneous with the improvement of the performance of the equipment. Our export prices must follow this too. But in the case of the parts base used for the manufacture of domestic computer technology the price level for elements deriving from socialist import is substantially higher than capitalist parts prices and there is no real sign of a decrease. The price of materials obtained from capitalist countries is decreasing relatively less for Hungarian manufacturers than it is on the world market.

In the future our situation will worsen because according to technological forecasts there will be a decrease in the ratio of those parts used in manufacture (resistors, capacitors) which we are in less need of importing because our technological backwardness is less. At the same time, the import ratio, nearly 75 percent, of active parts (transistors, integrated circuits, microprocessors) will not decrease significantly.

There are few branches of industry where American superiority on the world market is so unambiguous as in the manufacture of semiconductors. America produces 70 percent of the semiconductors marketed in the world each year; Japanese firms produce 20 percent. Even the western European firms, otherwise at the forefront in the world, are making feverish efforts to catch up with the U.S. and Japan. And although they are investing tremendous sums (French firms will devote half a billion dollars by 1984 to create independent semiconductor manufacture; Siemens purchased a 17 percent share of one leading American firm for 30 million dollars; in 1975 Philips bought the Signetics firm, the sixth largest U.S. semiconductor manufacturer; the English are devoting 70 million pounds to start state semiconductor manufacture) it can be taken as certain that under capitalist conditions, as a result of the microelectronics produced and used, the jobs of several hundreds of thousands of people will become superfluous and this will increase the already high unemployment to almost unbearable levels. And yet it appears that they have no choice; they must create leading semiconductor manufacture because if they lag in development they will lose their leading position in the "following" branches. According to calculations by Siemens the spread of microelectronics will force one million people out of their present jobs in the FRG by 1985; according to another West German estimate there are 9 million jobs in the FRG which will be affected by the introduction of microelectronics in the next 15 years. It is worth quoting verbatim the opinion of the former research director of Philips, who is now chief of a scientific-technical committee under the guidance of the Dutch government: "It is true here as it is of most revolutionary technological innovations, that on the one hand it will save manpower but on the other it will create entirely new work opportunities. So it will not increase unemployment itself, it will increase structural unemployment, which can be overcome if training is given in time. To stay out of this technological renewal--for whatever reason--is simply economic suicide!"[1]

Creating semiconductor manufacture--as can be seen from the foregoing figures--requires great investments. Today a single manufacturing line (without assembly and testing) costs about 5 million dollars. In addition the success of semiconductor production depends to a crucial degree on whether large series manufacture is achieved in every single product type. According to the experience of the world's first semiconductor manufacturer, Texas Instruments, an annual turnover of 100 million dollars is the lower limit at which a firm manufacturing semiconductors can survive over the long run on the capitalist world market. In the past few years United Incandescent has spent about 620 million forints to adapt one phase of integrated circuit manufacture on the basis of a licence from the American Fairchild firm.[2]

Compared with the above mentioned western European investment sums this figure does not seem very high and the production and type variety results thus far support this opinion but we do not know what is planned after they are fully operational.

The domestic parts industry (and to a certain extent this is true in the other socialist countries too) lags behind the international level and thus for years its participation in supply has stagnated at a low level and the ratio of productive import has increased. For example, in 1974 only 3.3 percent of the integrated circuits used in Hungary were of domestic manufacture; 10 percent came from socialist sources; the rest had to be obtained from capitalist countries. The ratios were similar in 1976. In this year about one-third of all electronic parts needs could be provided from domestic sources.[3] (This includes not only integrated circuits but also resistors, capacitors and connections.)

Providing a sufficient variety of parts for Hungarian computer technology manufacture is also made difficult by the fact that the variety needed coincides with that of countries with large parts manufacture but the quantities needed are a good bit smaller so whether there should be domestic manufacture or the present capitalist acquisition the characteristics economic indexes (productivity, optimal series size or the concessions given for large purchases) are less favorable.

Let us take as an example the 1975 data for transistor and diode acquisition. In this year Elektromodul brought 1,731 types of transistors into the country; 107 of these made up 93 percent of the quantity imported. Imported diodes represented 2,434 types; 112 types made up 95 percent of tne total quantity. (Our experiences acquired over several years in our institute in the KFKI [Central Physics Research Institute] show what great efforts are needed if we want to orient those developing computer technology devices toward using a narrower variety of types, but they also show the advantages which appear when handing over developed devices for industrial series manufacture.)

These figures not only call attention to the--probably superfluous--broad variety but also to a recurring problem--stockpiling. If a relatively small proportion of these types represents the great majority of the quantity then our acquisition and stockpiling policy cannot be correct.

Today only a very small part of the electronic parts (about one quarter of them) are stockpiled by the acquiring enterprise; for the great majority of them measures begin to be taken only after an order arrives from the user (asking for bids, selecting the ones with the best technical and economic indexes, placing an order). Depending on the type and the acquisition relationship this can take from three quarters of a year to two years, (three quarters of a year to a year is the average.)

This solution slows and makes difficult development and then manufacture; it may increase outdatedness; it makes it difficult to standardize the elements being used; and it increases stockpiles! It is also clear that an enterprise will accumulate larger stockpiles if it knows that it will receive another order within the year. If it is convinced otherwise or if a stockpiling enterprise should satisfy an order from the shelf within a few days then it is certain that materials would be ordered with significantly

less reluctance. And it is elementary economics that if ten manufacturing enterprises hold ten small stockpiles that is more than if one enterprise holds one large stockpile.

The situation is entirely different in our non-ruble accountint export. Here one can hardly even speak of computer technology export, the few million dollars per year represents such a small part in our total capitalist export. The reasons can be divided into two groups. There are reasons which represent basic problems in virtually all our foreign trade--the technical level which is not at the forefront (although the stormy technical development which can be noted in this area is outstanding even in the general technical development which has accelerated extraordinarily recently, technical "inflation" is greatest here, "moral" obsolescence is swiftest and technological competition is sharpest), the problems of foreign trade activity (sometimes a lack of suitable technical expertise), the long delivery times, not maintaining contract discipline and the unsolved nature of service and parts. And there is another reason too--our high, non-competitive prices.

The non-competitive prices of our computer technology products on the capitalist market can be attributed to two basic factors--the prices of parts and productivity. Since parts coming from the non-socialist relationship represent a large proportion in the manufacture of computer technology equipment we have observed how parts prices compare to one another in the case of a western computer factory and an Hungarian enterprise. We used several approaches in this comparison. In the first place we compared parts prices on the basis of computer technology journals and bills sent to the KFKI by Elektromodul; we then studied computer sub-assemblies, peripherals and finally complete computers.

In comparing parts prices we looked at the 14 types of integrated circuits purchased in largest numbers by the KFKI. We filtered out factors distorting individual cases (demanding extra swift acquisition or the super-price for very small numbers of units) but recalculating the average forint value thus obtained with the official price multiplier we always got several times the parts acquisition prices of the western computer factories. We then studied the acquisition price ratios for a few types where United Incandescent has begun domestic manufacture. Here there was an extraordinarily significant decrease as compared to the prices of Elektromodul but the prices of the Hungarian manufacturer were still higher as compared to the original American prices. Something else was discovered in this comparison; from diodes to integrated circuits the differences in the case of the two acquisition prices increased in direct proportion to complexity.

In comparing prices of sub-assemblies we studied one of the important units of computers, storages. In the new developments at the KFKI we first built in the product of capitalist firms; then, after successful testing, we used an equivalent type developed with a factory in the GDR and, in other cases, tried to use a product of the Videoton Computer Technology Factory.

In the case of the storage used for the KFKI's TPA [stored program data processing] type small computer the cost of the GDR product was 30 percent higher than the price of the original western delivery, with duties and higher shipping costs added.

For the TPA-1140 small computer the VT [Videoton] prices could be compared with the prices of the original western shipper. Depending on the technical solutions the price ratio varied between 3.5 and 8 times.

Of the computer peripherals the price ratio between socialist and capitalist equipment was--originally--double in the case of electric typewriters for data transmission.

In the case of large masses of data the results of the computer are written out on a line printer. Videoton bought a license from the Data Products firm and began to manufacture, in extraordinarily good quality, a VT version of the original line printer. The following table shows the development of prices.

Development of the Acquisition Price and the Production Price
(Acquisition Price equals 100)

| | Acquisition price from capitalist sources | VT price up to 1977 | VT price from 1978 |
|---|---|---|---|
| 80 column line printer | 100 | 208 | 156 |
| 132 column line printer | 100 | 289 | 136 |

We think that these examples prove that the present prices for parts and sub-assemblies make it practically impossible to achieve sale prices similar to the prices of capitalist firms and on the basis of what has been written thus far one can conclude that we will be able to increase our computer technology capitalist export only if--in addition to imporving foreign trade activity--the domestic manufacturers get parts, sub-assemblies and peripherals at prices and in a quality and variety similar to the capitalist manufacturers.

But let us look at a different approach to the situation. Let us examine a complete computer. At the end of 1977 the Commodore firm put their PET 2001 microcomputer on the market (this is a so-called personal computer). The PET 2001 microcomputer, with display, typewriter keyboard and cassette tape recorder, costs 795 dollars. Could we produce this at a similar price? Or is the acquisition price of the necessary parts and sub-assemblies higher than the capitalist world market price for the complete computer?

On the basis of a study of the diagrams of the PET 2001 and a set itself we could draw up a list of its chief parts.[4] On this basis we determined the need for imported capitalist parts and the catalogue prices for them. Using the recalculation factor of Elektromodul this came to 32,260 forints.

Let us suppose that we should produce in Hungary a personal computer similar to the PET and let us suppose that we could sell it on the world market for 800 dollars. At a selling price of 800 dollars the Hungarian manufacturer would get roughly 30,000 forints; so even at a favorable price he would just cover the price of the imported capitalist materials.

But let us presume that we could guarantee a capitalist sale and so got the import materials at a more favorable price. Even then--and still sticking to materials costs--there are the parts and sub-assemblies of domestic manufacture--printed circuit cards, power supply, keyboard, TV monitor, cassette tape recorder and mechanical parts. The acquisition price for the domestic sub-assemblies (on the basis of actual acquisitions by the KFKI, the bills of the shippers) comes to 68,500 forints.

Need we go on? One can clearly see in the case of a concrete, comparable product that the price for materials exceeds what could be obtained for the set and we have not even included in our calculation wage costs, overhead, the minimal necessary profit or taxes.

The basic problem--which we feel we have succeeded in proving with a comparison and analysis of prices--is that in the case of a capitalist sale the forint total of the selling price, recalculated with the appropriate price multiplier, does not cover even the forint price for acquiring materials originating from capitalist import. This reasoning applies only to a comparison of prices as published in the catalogues but one can show further disadvantages in special, unique cases. 1. It can be presumed that a western manufacturer, in the event of a large purchase of parts, will get the parts with a significant quantity price concession, not at the catalogue price used by us and used in the comparison. 2. The largest electronic firms have already set up their own parts factories (IBM, Western-Electric, Hewlett Packard, Rockwell, Siemens, Telefunken, Philips) and other factories which originally only manufactured semiconductors have begun to manufacture sets themselves (Texas, Raytheon). It is clear that the parts costs for equipment manufactured here can be only lower still. (This is somewhat contradicted by the fact that in addition to the mammoth firms named, the leading electronic factories, there are a great many small plants which do not have their own parts manufacture and yet can put their products on the market at competitive prices.) 3. Capitalist manufactures have a much smaller stockpiling cost than that burdening a Hungarian manufacturer because of the substantially shorter throughput time.

We feel that if we are to run into such disadvantages--apparently insurmountable--in regard to parts acquisition costs then the way to regain something in the competition is to try to produce more computer technology equipment and systems which require not material but rather intellectual activity and to do so with higher productivity than our competitiors; thus the ratio of software and services should occupy an ever greater part in our marketing.

Let us now examine the productivity indexes. According to a survey by the KSH [Central Statistical Office] based on 1967 data if we put production per worker in Hungary at 100 then the indexes were 208 for France, 166 in Czechoslovakia and 140 in the case of Austria. The figures for the machine industry alone were 389, 184 and 152 respectively, thus worse than for the average characterizing industry as a whole. The electronic industry therein produced substantially better results; if Hungary was 100 then France was 191 and Czechoslovakia was 115.[5]

In 1964 production per employee in industry in the U.S. was about six times that of Hungarian industry but on a list of all European capitalist countries (except Portugal) and all socialist countries (except Albania) the only country with a worse index than Hungary was Greece.

We compared Hungarian data to Yugoslav data on two occasions, in 1960 and in 1970. Production per worker in Yugoslav industry was 12 percent lower than in Hungary in 1960 but in 1970 it exceeded the Hungarian value by 5 percent. The productivity level of the machine industry was 10-20 percent higher in Hungary in 1960 and 1-10 percent lower in 1970.

We also compared data for Austria and Hungary on two occasions, in 1965 and in 1975. Considering that the world economic crisis of 1973-1974 had an extraordinarily severe effect on Austria while the effect of it had not yet reached Hungary it was expected that there would be an improvement of the extraordinarily bad results deriving from the 1965 comparison. In contrast to this the data showed a further deterioration. Just as an example (and noting that in the 1975 Austrian data the machine industry does not include data for the instrument industry): production per employee in Austrian industry, where Hungary equals 100, was 138 in 1965 and 175 in 1975. For the machine industry alone this index was 150 in 1965 and 190 in 1975.[6]

Turning to the electronic industry the annual production value per worker averaged 254,000 forints in Hungary in 1975, on the basis of data from Dr Miklos Szalai.[7] There were significant deviations from this average depending on product composition. For example, it was an annual 217,000 forints per capita in parts factories and 270,000 forints for the manufacture of equipment. These figures represent one-half to one-third of the figures produced by U.S. factories.

We will not analyze the reasons for the inadequate productivity indexes, we will only list a few of them (these are characteristic primarily of the electronic industry and the computer technology industry but basically they are characteristic of Hungarian industry as a whole): the work intensity of the workers is smaller (in England, otherwise only in the middle range in productivity, they figure 1.8 seconds per soldering with a soldering iron, for us it is 4.6 seconds); organization and material supply problems; the low level of contract discipline (because of this practically every factory manufactures parts, for example, in smaller

quantities and in larger variety than optimal); there are no factories specializing in the manufacture of sub-assemblies (power units, printed circuits); there is no uniform parts selection or uniform design system; and the assembly plants are inadequately mechanized and automated.

Simply raising the level of mechanization and automation, without eliminating the other deficiencies, would not achieve the goal, would require enormous investment sums and would be truly economical only in the event of suitable series size. And yet this is the solution to raising the level of our productivity.

There is a widespread view that our relatively lower wages, as compared to the wage level existing in capitalist firms, might represent a factor increasing our competitiveness in exporting our computer technology equipment in the non-ruble relationship. This factor, however, is not sufficient in itself. As Ferenc Kozma has proven in one of his articles: "It is a myth that one can gain a foreign economic advantage on the basis of national wage differences--the national cost differential for manpower reproduction. In general the reproduction costs of manpower are proportional to the productivity of the society."[8] So the extra accumulation deriving from the low live-work costs relative to productivity is not a comparative advantage. The final conclusion of the author of the article cited is: "In no case can we base our strategy on the idea that the level of domestic living conditions is lower as compared to the productivity of national work than it is for the purchasers of our export products. This is not even true today." Well organized work requiring highly skilled training and the possibility of increasing productivity through mass production can be factors increasing economicalness in the international exchange of goods.

We saw before that the level of productivity now represents for us not an advantage but rather a disadvantage. And large series manufacture is not characteristic of our computer technology export in the capitalist relationship. Thus far this export has been basically and decisively in two types of products--certain computer technology units (displays, line printer character barrels) based on the OEM and software though there have been a few systems deliveries also--to a very small extent for the time being.

Peripherals sales on the basis of the OEM (we deliver only the equipment here and undertake no sort of service) are precisely not the type of sales which would be our most economical export item, because of the high price of parts and our relatively low level of productivity, but we have had relatively favorable results here because large series manufacture is guaranteed by the capacity and demand of the large socialist market. Even here there are things which need improving.

The question of buying licenses is also part of marketing peripherals in the non-socialist relationship. The buying of licenses has doubtless contributed to a large degree to our large scale computer technology manufacture. Results more favorable than the machine industry average

have been characteristic of the computer technology branch in this matter. The purchase of a license by Videoton from the French firm CII, which formed the foundation for computer manufacture by Videoton, the purchase from Data Products of the license needed to market line printers, taking over the know-how from Siemens for the manufacture of ferrite storages, also for the VT, and the license purchased by the MOM [Hungarian Optical Works] from SAGEM for the manufacture of fixed head magnetic disc storages were especially significant.

We do not want to evaluate the experiences of license purchasing more profoundly, we want only to pose a general problem. When buying licenses--for understandable reasons--we are not able to purchase licenses for the best equipment known in the world; rather, we purchase products which are 2-4 years behind the leading products of the world--in a few cases only 0.5-1 year behind. And there is no further development after the purchase. The reason for this is to be sought primarily in the fact that domestic R and D capacity is included to only a minimal degree in the purchasing and adapting of licenses. (At the same time it must be noted that in a few cases the technical level realized on the basis of an earlier license purchase made possible the creation of license contracts where the lag shrank substantially.)

Software sales now constitute a significant part of our export in the non-socialist relationship. Basically software can be of two types--system software, which contains the programs needed to operate the computer, and applications software, which contains programs realizing computer solutions to concrete user needs.

A general and a special problem burden our software export in the non-socialist relationship. The general problem is that capitalist customers do not like to buy from a firm they do not know. The special problem is that although the basic knowledge of Hungarian experts is often more profound than that of their western colleagues their current knowledge--of the concrete, new machines--is usually at a lower level because even in the best case the Hungarian experts generally get to know the new computers with a delay of several years. As for the economicalness of our software export it is a fact proven many times that the price for the export of software only is lower than if the software is tied to delivery of a computer.

So the solution here also would be a complete task solving computer system. It is obvious that in the case of such export the goal mentioned so often already will reappear--increasing the intellectual ratio, thus achieving a competitive price and increasing capitalist export. But the ratio of the intellectual value can be increased only if the device embodying the inspiration is based on similarly modern, competitive parts. And this completes the circle. The creation of the modern parts manufacture at the world level needed for computer technology products (and electronic products in general) is a question of fundamental importance! We can realize the possibilities we actually have if we openly admit the difficulties and define the goals and the ways and means to achieve them.

FOOTNOTES

1. Dr Anna Sandor: "A Chip Society?" (VILAGGAZDASAG, 1979, III, 28.)

2. VILAGOSSAG, 1979, I, 20.

3. Dr Gyula Tofalvi: "The Situation and Future of Our Electronic Industry." (A lecture at the "Parts Conference" held in Szekesfehervar, 15-16 September 1977.)

4. Zoltan Zamori: "An Example of a School Computer." (An MTA-KFKI report, manuscript, 1978.)

5. Dr Laszlo Drechsler, Kux Jaroslav and Dr Mrs Ferenc Nyitrai: "An International Comparison of Work Productivity." (STATISZTIKAI KIADO, V, 1974.)

6. "A Bilateral Comparison of Industrial Production and Productivity in Austria and Hungary." (STATISZTIKAI IDOSZAKI KOZLEMENYEK, Vol 127, KSH, December 1968.) "A Comparison of the Industrial Production and Productivity Levels of Austria and Hungary." (STATISZTIKAI IDOSZAKI KOZLEMENYEK, Vol 404, KSH, 1977.)

7. Dr Miklos Szalai: "Our Electronic Industry In The Mirror of the Production fo Developed Industrial Countries." (Manuscript, KFKI, September 1978.)

8. Ferenc Kozma: "The Role of the Human Production Factor in Increasing Foreign Economic Efficiency." (GAZDASAG, 1978, 3.)

8984
CSO: 2502

HUNGARIANS WORKING FOR WESTERN SOFTWARE TESTING FIRM

Budapest HETI VILAGGAZDASAG in Hungarian 12 Jan 80 pp 30-31

[Interview with Harry Sneed, Software Research Associates]

[Text] Harry Sneed is doing nothing more than trying to "make a little something" for himself from the great differences in the world economy, from the technological difference between the US and Western Europe and from the wage level difference between Western and Eastern Europe. His Munich firm called Software Research Associates employs 10 Hungarian brains, in addition to himself and his secretary; these brains are also "owned" by employees of two Hungarian institutes, SZAMOK (International Computer Technology Training and Information Center) and the SZKI (Computer Technology Coordination Institute). The 42 year old programming expert living in the FRG brought the technology of the firm from his country of birth, the US. Harry Sneed studied computer technology at Maryland University. Moving to Europe, he worked 4 years at the Volkswagen computer center and the same amount of time for Siemens. Since 1977 he has been an independent consultant and in the spring of 1978 he formed an independent firm with his own capital.

[Question] How did Software Research Associates come into being and how did you come in contact with Hungarian computer technicians?

[Answer] Actually the two things happened at once, naturally as a result of chance. In February 1978 at a conference in London I gave a talk on a testing method, that is a method for testing computer programs, which I had been dealing with previously only in theory. A Hungarian computer technician was sitting next to me and he asked if I would like to use my method in practice in cooperation with his institute, SZAMOK. I discussed the details in March in Budapest and a few weeks later, using my own capital, I founded the Software Research Associates (SRA) in Munich as a sister enterprise and signed a contract with Metrimpex, the Hungarian foreign trade enterprise, according to which five systems programmers each from SZKI and SZAMOK would work for me, half time in their own place of work and the other half for my FRG clients.

SRA consists of three independent sister enterprises. One is in San Francisco headed by Dr Miller, who is the intellectual father of the testing method used by us, employing seven people and using a minicomputer. There is another sister enterprise in Tokyo with 200 workers and a medium size IBM computer. Finally there is myself with the SRA, a West German-American-Hungarian sister enterprise, at least that is what I like to call it, with 10 Hungarian workers, an administrator, a small office in Munich and an IBM computer and a Siemens computer at SZAMOK and the SZKI respectively.

[Question] Only a minority of our readers will know precisely what testing programs means, what your firm is doing.

[Answer] Actually testing is nothing more than the quality control of computer programs. For example, if an enterprise uses a computer to keep records on stockpiles, for bookkeeping or any other task it can relatively easily prepare or buy these so-called user programs. But it is a very special computer technology task to determine if these programs really work well or if they are the most optimal solutions of the given task from the viewpoint of programming. Naturally the big software houses preparing the programs are dealing with this too but we are the first independent test laboratory in Europe, that is dealing only with testing.

At the moment the testing procedure used by us, developed through several years of research, is the most modern in the world, better than that used by IBM. It is not by chance that IBM also entrusted us with the development of a testing system.

[Question] What other commissions does the SRA have?

[Answer] We first developed a testing system for Siemens, the so-called Prufstand, and this is our best known reference today. Siemens wanted to sell the system to the Swiss army too but when the latter learned that the work had been done partly in Hungary with Hungarian cooperation they not only broke the contract but raised such a stink that the supreme leaders of Siemens got nervous too, as if this was some sort of technological leak which should not go to Eastern Europe. After that it was months before I could set foot in the Siemens Works. The matter has been settled since then and at present we are working on perfecting the Prufstand. We are also preparing a testing system for the Quelle department store concern and for testing the programs provided for the machines of the West German Kienzle firm which manufactures small computers. We also have a commission from the German Federal Post to prepare testing programs.

[Question] You are constantly traveling between Munich or other West German cities and Budapest. You seem to carry your office in your briefcase. And your clients are disturbed that you employ Hungarians. It would appear that very real advantages compensate for all these disadvantages.

[Answer] My colleagues in the FRG often ask me why I do not employ West German computer technicians like all other similar firms--the so-called software houses--in the FRG. The answer is obvious: It is cheaper to come to Budapest once a month than to maintain an office in Munich. The latter would cost me 3,000 marks a month, not even to speak of renting a computer, which would be at least 200,000 marks a year. I can fly here and back once a month for 750 marks, and it is cheaper to live in Budapest than in the FRG. My people work on the computers in their own places of work, the IBM computer at SZAMOK and the Siemens computer at the SZKI, just the two types which the great majority of our clients use. I pay Metrimpex an hourly wage of 60 marks for a so-called systems programmer--they do the highly qualified programming work--while the going price for the same work in the FRG is about 100 marks. We have agreed on a fee of 17.5 marks per computer hour.

Under these conditions I am in a somewhat better competitive position than my West German competition, which I need because of the above mentioned disadvantageous discrimination. Naturally the deal is advantageous to Metrimpex too. I pay 75 percent of my receipts deriving from the work of the Hungarian programmers to my Hungarian partners, and this comes to about one million marks per year. The entire remaining 25 percent goes to development, to the development of testing systems, such as the one I am developing for IBM computers, for which I do not get a red cent at the moment, but by preparing them I anticipate the needs of the customers.

[Question] Aren't you afraid that your Hungarian partners, who are now learning the most modern techniques of testing, may themselves enter the market as competition to the SRA?

[Answer] There is no danger of that. This area of computer technology, software, is a business based on trust. The customer can easily go wrong, pay out a pack of money and get nothing useful for it. This is especially true of our narrower field, testing. In addition they demand a great deal of security in the FRG so it cannot be imagined that they would talk to someone--let us say a representative of a Hungarian enterprise--who simply walked in off the street and offered services in the area of testing program systems.

There is another obstacle too, which is a problem for Hungary; it is my feeling that there are few expert leaders at the middle level, capable of making decisions. In my own special field I have found that while you have very well trained, expert computer technicians those who go out and make the deals are generally bureaucrats. I have not found any who were at home in both fields, those we call technical managers. A related problem is the lack of so-called project managers or theme leaders.

I must say that as a technical manager I am an indispensable link between my Hungarian partners and my West German clients. I not only make the deals but as a consultant I participate in the design of the program systems.

[Question] Are you free to choose your colleagues or do your partners change them from one year to the next?

[Answer] I did not select my colleagues and the contract does not restrict Metrimpex in how they are rotated. But it would be very sad if I got different people when our contract is renewed because my capital is in the heads of my Hungarian colleagues.

[Question] What prospects do you see for cooperation with Hungarian partners? Is there any idea of founding a joint enterprise?

[Answer] Yes, Metrimpex would like to buy shares in my firm. But why would this be good for me? Now I make the decisions entirely alone. Also Metrimpex would like to increase our business but I am striving for quality rather than quantity. I plan to increase the number of my colleagues from 10 to 12-15.

I have a lot of good ideas for expanding our contacts. One will soon be realized. We are organizing a one week seminar in Budapest for West German programmers. Such a course generally costs 1,900 marks in the FRG; we are offering it for 1,800 marks complete with travel, full board and lodging and the romance of being in Hungary. And a seminar is the best advertising because we will be selling our products as we give lectures on our methods.

8984
CSO: 2502

## ADVANCES IN INTEGRATED CIRCUITRY NOTED

Budapest MUSZAKI ELET in Hungarian 11 Jan 80 p 4

[Article by Andras Lorinczy: "Silicon Based MIS Devices"]

> [Text] It is an important property of the sandwich structures of the MIS, metal-insulator-semiconductors, that they can be controlled by the voltage through the insulator and their power requirements are very small. This is primarily why they are used for very complex semiconductor devices with a large number of elements. These circuits are widely used in computer, signal and control technology. In the family of devices based on the MIS an important role is played by memories, more and more of which we must obtain from the capitalist market for equipment manufactured here. This is one reason why domestic basic research began nearly a decade ago and is being continued within the framework of the Research and Development Association formed several years ago. We sought information about this at the Lorand Eotvos Physics Society from Andras Lorinczy, deputy chief of the scientific main department of the Technical Physics Research Institute of the MTA [Hungarian Academy of Science].

Before all else a new sort of measurement technique had to be developed to carry out the physical tests planned. A technology line most demanding of material and equipment had to be developed to produce the MIS structures of the FAMOS, MNOS and CCD types because the really important, complex circuits cannot, in general, be modelled with simple elements. The FAMOS and MNOS types are so-called non-volatile, read-only memories which retain the inscribed information permanently even after reading. They can be re-programmed if need be because the FAMOS can be erased with ultraviolet light and the MNOS can be erased electrically. They function in three ways: write, store and erase. Our studies were limited primarily to an investigation of the design and technological interdependencies of these phases. We wanted to ensure swift inscription with low power, large storage capacity and the possibility of swift erasure without "degradation."

In the case of the FAMOS the technological development is being done by the Signal Technology Industrial Research Institute; our institute offered the necessary measurement technique background. We first determined the insulator layer thickness, the diffusion penetration depth, the base material concentration and the geometric form needed for the function of the basic cell (single memory element). We then turned to multiple cell structure and determined under what conditions we could prevent the cells from interfering with one another, where the optimum was between the conflicting demands of inscription and storage and the most suitable method for the mechanism of memory storage. Our basic physics research made a significant contribution to HIKI [Signal Technology Industrial Research Institute] being able to create a 64 bit (cell) memory unit the operational parameters of which achieve the level of similar devices of famous firms. During 1979 a 2 kbit memory unit was successfully tested at the HIKI also.

Our institute is dealing with MNOS memories on its own initiative. We grew a 3-5 nanometer thin silicon oxide layer on a silicon base and then created on this, with heat decomposition, a 50-70 nanometer silicon nitride layer. In this device information storage takes place in the region of the oxide and nitride boundary surface in such a way that the electric charges go through the oxide layer with a tunnel effect into the holes of the nitride. One direction of our research and development in connection with this was the development of a perfectly structured, high purity oxide layer and the creation of a suitable nitride layer structure determining storage capacity. The other direction aimed at design development of the geometry of the cells with which we could achieve the properties desired of the memory. We succeeded in working out a technology which ensures parameters of MNOS devices reaching the world level. We have an 8 cell memory working and by the end of 1979 we will have a 64 cell completely decoded circuit. In conjunction with the HIKI we are planning to create in the years ahead the 2 kbit MNOS memory needed by the equipment manufacturing industry.

The FAMOS and the MNOS devices are operational memories. Because of their properties and their small size they can be used advantageously as auxiliary memories in microprocessors and they are capable of storing microprograms and control instructions permenently or temporarily. Also on our own initiative our institute is dealing with the development of CCD devices, which are non-operational memories. The CCD family of devices works on an entirely new principle because information is stored on the silicon surface in potential holes created by an electric signal, and is transmitted along the surface. Thus the CCD type is a sequentially accessible memory where the electrodes are placed in parallel on the insulating oxide layer grown on the silicon. The voltages connected to the electrodes create the storage locations which cease to exist in the absence of voltage. Information input can be by electric means, when we inject electrons into the first cell, or by optical means where the charge carriers are generated with light. It is primarily this dual property which makes possible their multiple use. For example, sequential memory, which can be developed to the size of a large volume storage memory, line reader or picture reader, all the way up to a highly complex solid state Vidicon TV camera.

In the course of our research we have improved the quality of the silicon surface and of the grown oxide layer so much that we have approached an error-free condition. Thus far we have created structures of various types, of which a polysilicon-aluminum-two gate version has proven most suitable. Our 32 bit CCD memory works very well as an analog medium frequency filter too. We will soon have a 64 bit version and we are designing the 128 bit CCD device desired by the equipment manufacturers.

8984
CSO: 2502

HUNGARY

# DISCRETE THICK FILM RESISTORS TO BE PRODUCED

Budapest FINOMMECHANIKA MIKROTECHINKA in Hungarian Vol 18 No 11, 1979 pp 339-340

[Article by Lenke Leopold and Janos Szatmari, REMIX Radio-Engineering Enterprise]

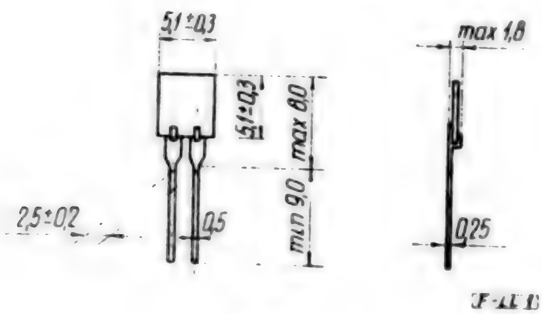
[Text] The authors present a brief summary of the properties of discrete thick-layer resistors, their main areas of application, and long-range trends, primarily with the meeting of all needs of domestic users as the goal. They draw special attention to the fact that discrete thick-layer resistors should be used increasingly and that this should be taken into consideration when designing and developing such devices.

The thick-layer technology is used in a wide area in the field of insulator-based hybrid integrated circuits. In these circuits we also find passive components which can also be made by means of the thick-layer technology. This engineering solution seems like a move backward since it produced the thick-film resistor as a discrete component.

The relatively high costs of the so-called "pasty substances" and aluminum oxide substrates used in thick-layer technology are compensated by those advantages which are benefiting both users and manufacturers. The resistance materials have values of 1 ohm/□...10 mohm/□ ; this wide resistance range allows the manufacture of devices with a similarly wide range of resistivity. The discrete thick-film resistors may be manufactured in the same facilities as components of hybrid integrated circuits. Accordingly, we see more and more discrete thick-film resistor types in the catalogs of the major component manufacturers.

The REMIX Radio-Engineering Enterprise joined these manufacturers abroad, and—taking domestic requirements into consideration—developed Type R5362, a basic type of a discrete thick-film resistor family.

The outside appearance of the thick-film resistors developed is planar, in contrast to the cylindrical configuration of the classic film resistors. The output solution may be plugged and be inserted directly into the sleeve, similarly to the "dual in-line" and "single in-line" contacts of components of hybrid integrated circuits. Securement of the output contact to the contact on the substrate may be accomplished both by spring loading and soldering. This solution, compared to clamp securements in classic cylindrical resistors, provides dependable contact at all times.




*1. ábra*

Fig. 1

The following are the main parameters of Type R5362:

Dimensions: See Fig. 1
Rated resistivity ($R_n$): 10 ohms - 3.3 mohms
Resistivity series: E6
Resistivity tolerance: ±20%, ±10%, ±5%
Thermal resistivity ($R_{th}$): 170 K/W
Rated loadability ($P_n$) as a function of ambient temperature ($\theta$): See Fig. 2.
Limit voltage: 150 V
Surface temperature: Up to +155C°
Temperature coefficient: Up to $\pm 250 \cdot 10^{-6}$/K
Noise voltage:

| | |
|---|---|
| $R_n \leq$ 33 kohm | Up to 1 µV/V |
| $R_n \leq$ 330 kohm | Up to 5 µV/V |
| $R_n >$ 330 kohm | Up to 50 µV/V |

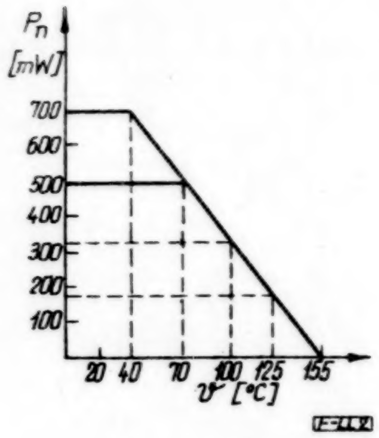



Fig. 2

Climate-resistance code: 55/155/56
Stability (70°C, 1000 hrs): Up to ±1% or 0.5 ohm
Weight: 0.2 g
Beyond the temperature coefficient of 250 ppm for the standard type, it is possible to provide TC values of 100 ppm or 50 ppm in certain resistivity ranges. Of course this involves a price adjustment. The small dimensions and relatively high loadabilities are worthy of special mention. The resistors have good stability and may be installed densely. This represents a major saving to the manufacturere since the panels are expensive. Figures 3a and 3b illustrate the space requirements of R5362 clearly, compared to the classic type R510, which has comparable loadability. Since the thick-film resistors are small, their weight is approximately ⅓ of the weight of classic resistors (it is only 0.2 g, compared to 0.6 g). Thus, this type may be used to advantage in all situations where weight makes a difference (such as portable instruments, vehicle manufacture).

On the long range, we work on the extension of the commercial complement. In doing this, we take into consideration the international trends and the needs of domestic users. This development proceeds in several directions. The level of several 100 mohms is expected as the top of the resistivity range. There are requirements for this in the socialist sector already.

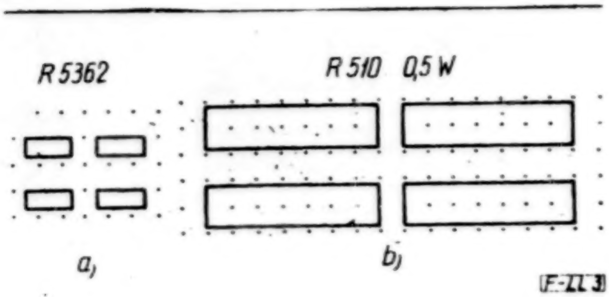



Fig. 3

The loadability range will also be extended. We also desire to meet the need for exposures to high voltages beyond 20 kV. Further size reduction is primarily an economic matter; it must be examined on a case-to-case basis.

Small-scale manufacture of the basic R5362 type has started in 1979, and we were already able to take the specific needs of some users into consideration. Series manufacture of the type is scheduled to begin in 1980.

We provide the needed information to potential users who now design their future products. This permits them to use the products in their devices under development and provides them with assurance that they will be available. We entertain the hope that the users will avail themselves of this potentiality and will incorporate the discrete thick-film resistors in their products.

2542
CSO: 2502

END

END OF FICHE

DATE FILMED

28 FEB '80

MAK